Comparing profitability of forestry and farming

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Outline of talk

- Introduction
- What measures of profitability?
- What data?
- What do we know about profitability of forestry?
- What is the relationship between profitability and land use change towards forestry.
- Some numbers
- Thoughts for further work

Comparison of profitability

- Forestry and agriculture use different metrics for profitability. Partly because they are different types of businesses – timber forestry is an investment business, agriculture is a cash flow business
- Sheep and beef farming uses economic farm surplus – profitability measure
- Forestry normally uses NPV (one rotation), or LEV (perpetual forest), or Internal Rate of Return

Definitions

1. Economic surplus is:

net cash income

+ change in livestock values

- farm working expenses

-depreciation

-wages of management.

Like EBIT

2. Internal rate of return is:

The discount rate such that

NPV = 0

Measure of profitability

- The IRR or internal rate of return was used to compare land uses
- Equivalent to a return on assets for a business with annual cashflow
- Simple to calculate from available data for agricultural land uses

Model for calculating forestry IRR

Forestry (national average) 2.71%

year	land value	Revenue	cash costs	net discounted cash flow
0	-$5,700			-$5,700
1			-$1,283	-$1,249
2			-$100	-$95
3			-$100	-$92
4			-$100	-$90
5			-$1,008	-$882
6			-$907	-$773
7			-$514	-$426
8			-$806	-$651
9			-$100	-$79
10			-$560	-$429
11			-$100	-$75
12			-$100	-$73
13			-$100	-$71
14			-$100	-$69
15			-$100	-$67
16			-$100	-$65
17			-$100	-$63
18			-$100	-$62
19			-$100	-$60
20			-$100	-$59
21			-$100	-$57
22			-$100	-$56
23			-$100	-$54
24			-$100	-$53
25			-$100	-$51
26			-$100	-$50
27			-$100	-$49
28			-$100	-$47
29			-$100	-$46
30	$5,700	$61,931	-$41,784	$11,590
sum				$0

Comparison of profitability, 2008

	Property						
Model	**Effective area (ha)**	**Net Cash Income**	**Working expenses**	**Manage-ment costs**	**Cash surplus**	**Capital value**	**IRR %**
Dairy (National average)	126	$1,021,886	-$468,449	-$83,610	$469,828	$5,942,256	7.91%
Sheep and beef (Nat. avge)	708	$287,803	-$180,002	-$34,324	$73,477	$4,468,186	1.64%
Viticulture (Marlborough)	25	$907,273	-$288,576	-$75,000	$543,697	$9,073,512	5.99%
Kiwifruit (Bay of Plenty)	5	$147,975	-$116,626	-$48,051	-$16,702	$1,705,110	-0.98%
Arable (Canterbury)	285	$903,000	-$490,670	-$75,000	$337,330	$6,561,300	5.14%
Deer (South Island)	180	$227,602	-$109,172	-$58,771	$59,659	$2,777,085	2.15%
Forestry	500	$682,079	-$554,858	-$50,000	$77,221	$2,850,000	2.71%

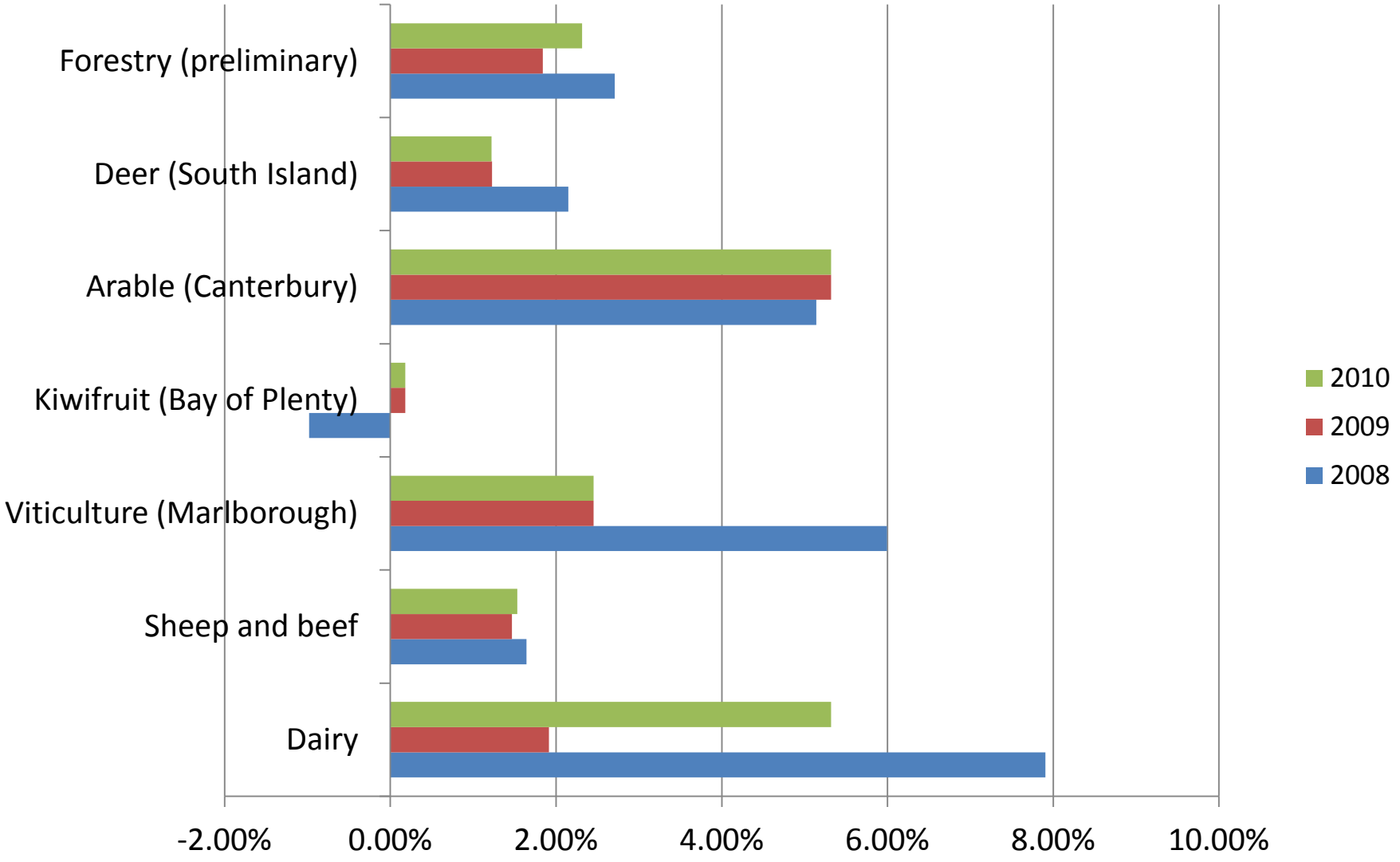
Data from MAF Farm Monitoring Reports, author's estimates for forestry

Profitability, 2010

	property						
Model	**Effective area (ha)**	**Net Cash Income**	**Working expenses**	**Manage-ment costs**	**Cash surplus**	**Capital value**	**IRR %**
Dairy (National average)	138	$931,703	-$492,162	-$83,774	$355,767	$6,687,831	5.32%
Sheep and Beef (Nat. avge.)	771	$362,550	-$215,082	-$75,000	$72,468	$4,726,181	1.53%
Viticulture (Marlborough)	31	$569,200	-$292,900	-$75,000	$201,300	$8,208,200	2.45%
Kiwifruit (Bay of Plenty)	5	$189,400	-$139,500	-$47,000	$2,900	$1,602,100	0.18%
Arable (Canterbury)	300	$1,012,000	-$597,400	$75,000	$489,600	$9,204,000	5.32%
Deer (South Island)	272	$277,670	-$151,847	-$73,707	$52,116	$4,270,679	1.22%
Forestry	500	$754,983	-$638,831	-$54,929	$61,223	$2,644,000	2.32%

Data from MAF Farm Monitoring Reports, author's estimates for forestry

Comparison of profitability



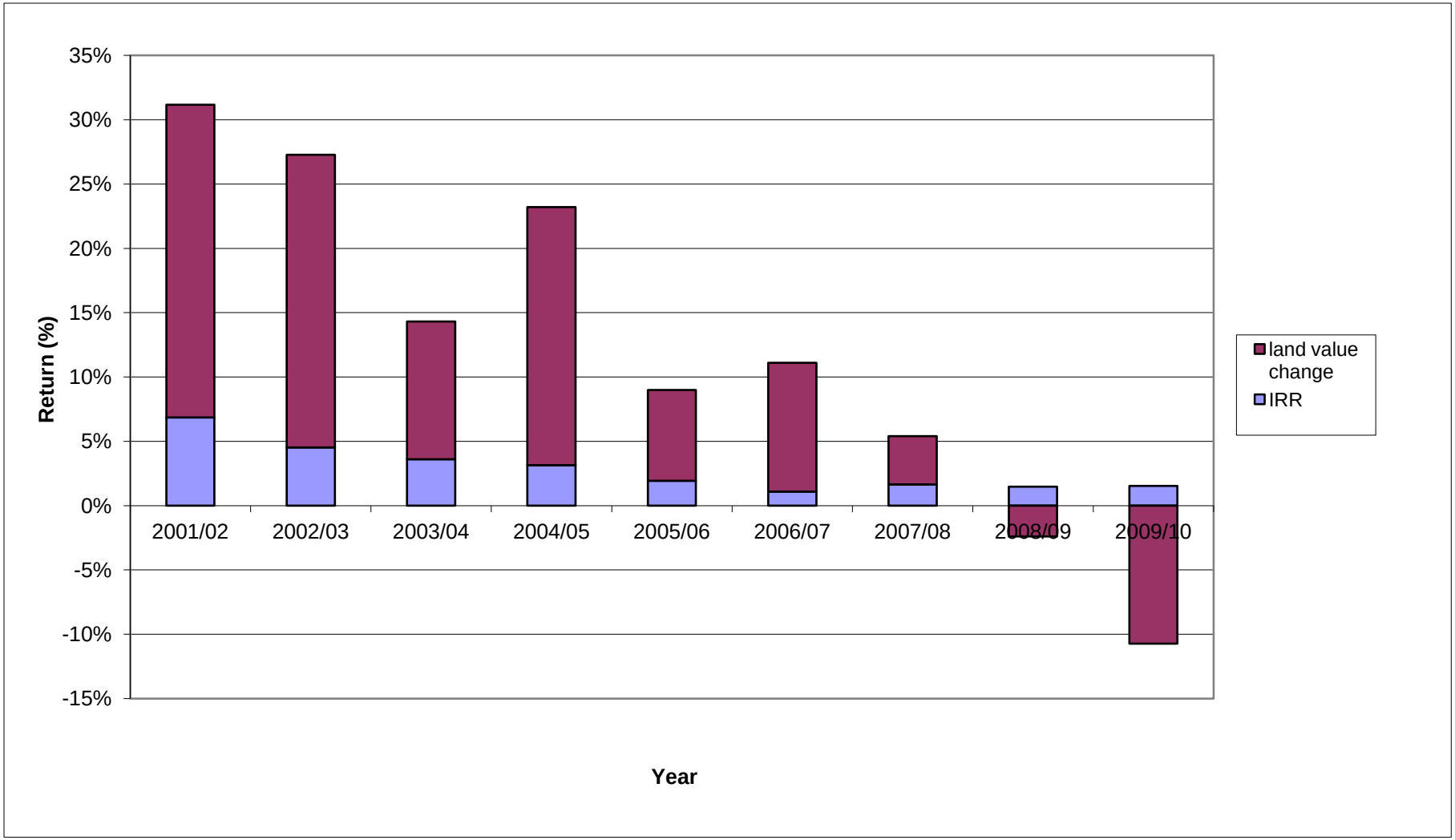
Data issues

- There are no national property level data for the forestry land use.
- This is what is provided by the MAF Farm Monitoring reports for the agricultural/horticultural land uses
- This is an obvious gap in our available data

Trends over time

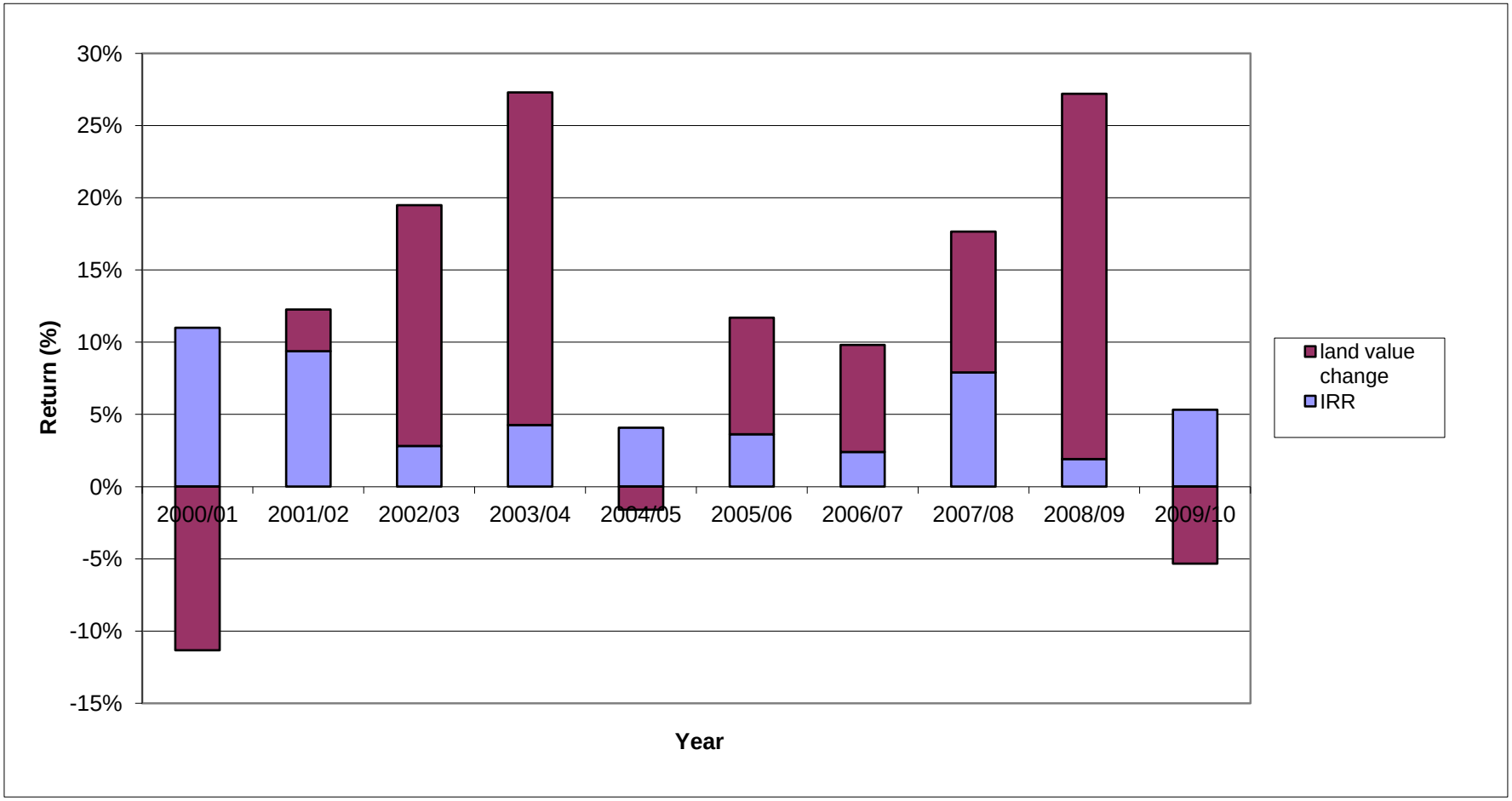
- Data are available for about 10 years for most agricultural land uses.
- Looked at trends for dairy, and sheep and beef

Total returns, Sheep and beef



Data from MAF Farm Monitoring Reports

Total returns, Dairy



Data from MAF Farm Monitoring Reports

Findings

- Average returns:
  - Dairy 2001 to 2010 : 5.27%
  - Sheep and beef 2002 to 2010 : 2.87%
- For dairy, land values respond fairly readily to change in productive value
- For sheep and beef, until recently, land values were increasing in spite of inadequate productive returns

Other information

	Cows per ha	Effective area (ha)
1999/00	2.57	92
2000/01	2.43	95.6
2001/02	2.57	96.1
2002/03	2.67	102
2003/04	3.02	104
2004/05	2.67	117
2005/06	2.77	123
2006/07	2.86	126
2007/08	2.82	131
2008/09	2.90	135
2009/10	2.93	138

	Effective area (ha)	stock units per ha
2000/01	614	7.6
2001/02	586	7.3
2002/03	627	7.8
2003/04	636	7.7
2004/05	660	7.6
2005/06	708	6.3
2006/07	708	6.4
2007/08	705	6.4
2008/09	716	5.8
2009/10	771	6.1

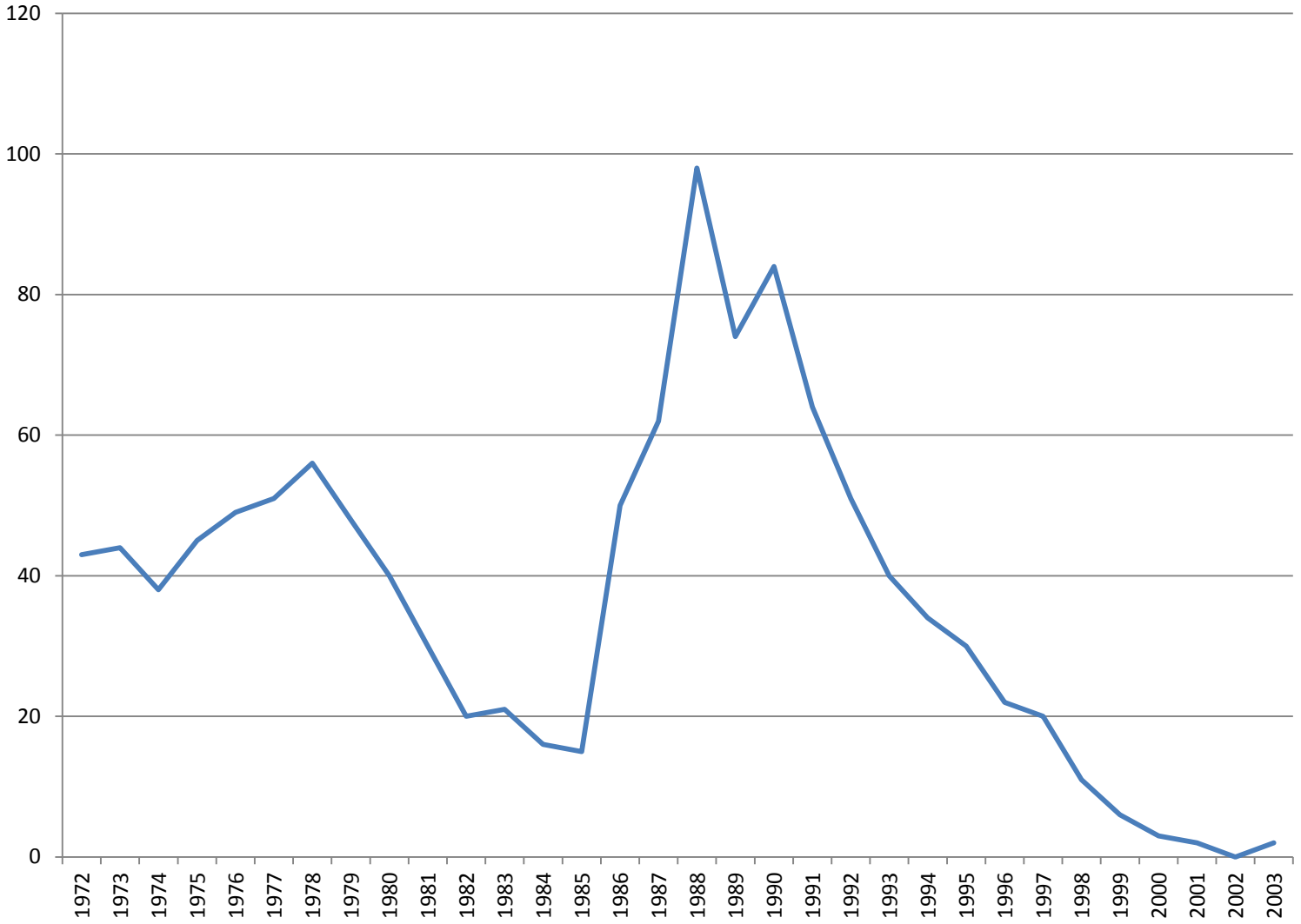
Fair comparison?

- Forestry is treated as a start-up, the other land uses are treated as going concerns
- Forestry is using average land values for hill country sheep and beef.

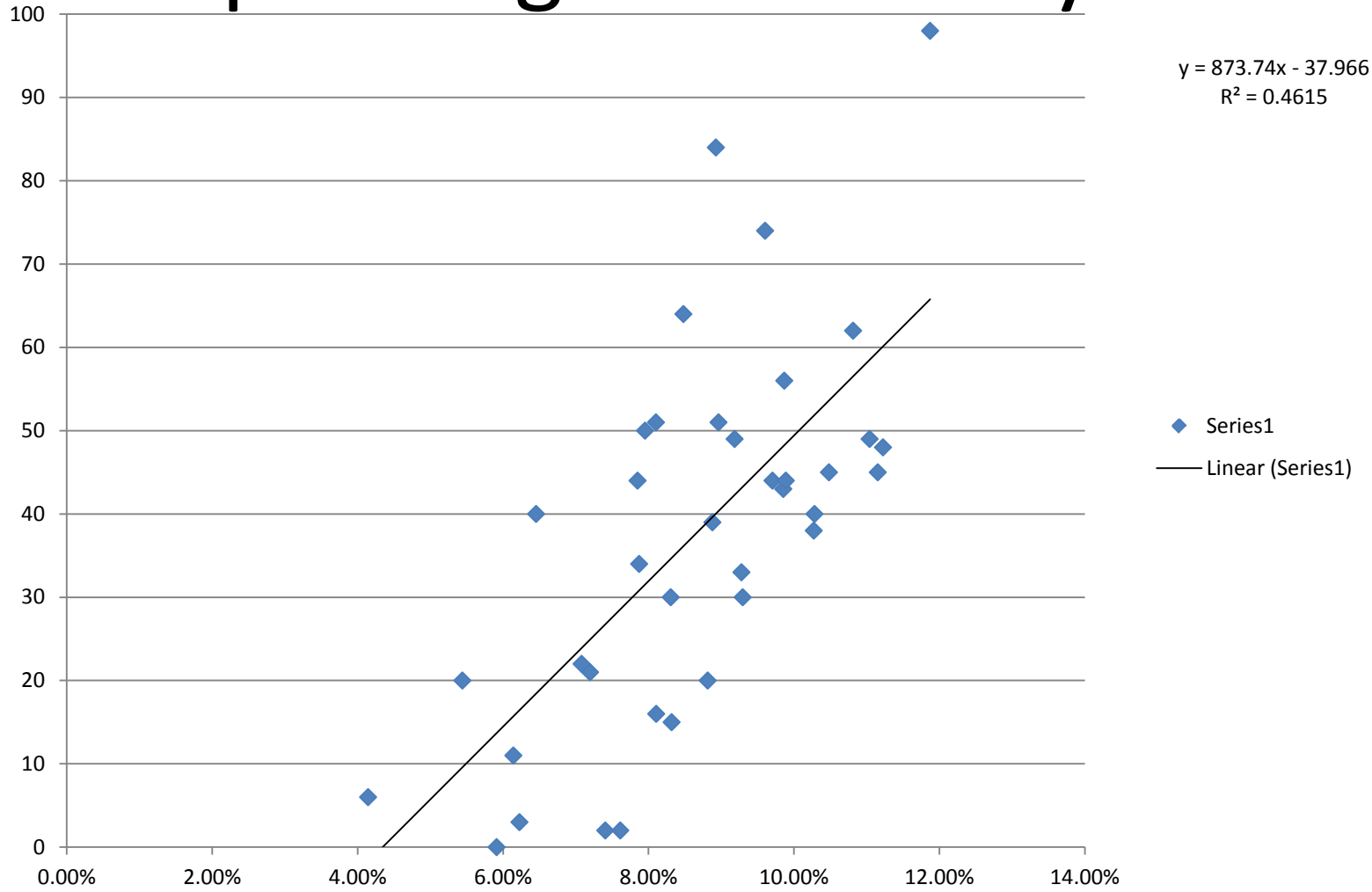
Profitability as a driver of land use change?

- Used this model to estimate profitability of forestry through time.
- Used the LEV (can be thought of as the maximum price that could pay for land and still make required rate of return
- Looking for a model that predicts land use change towards forestry (new land planting)

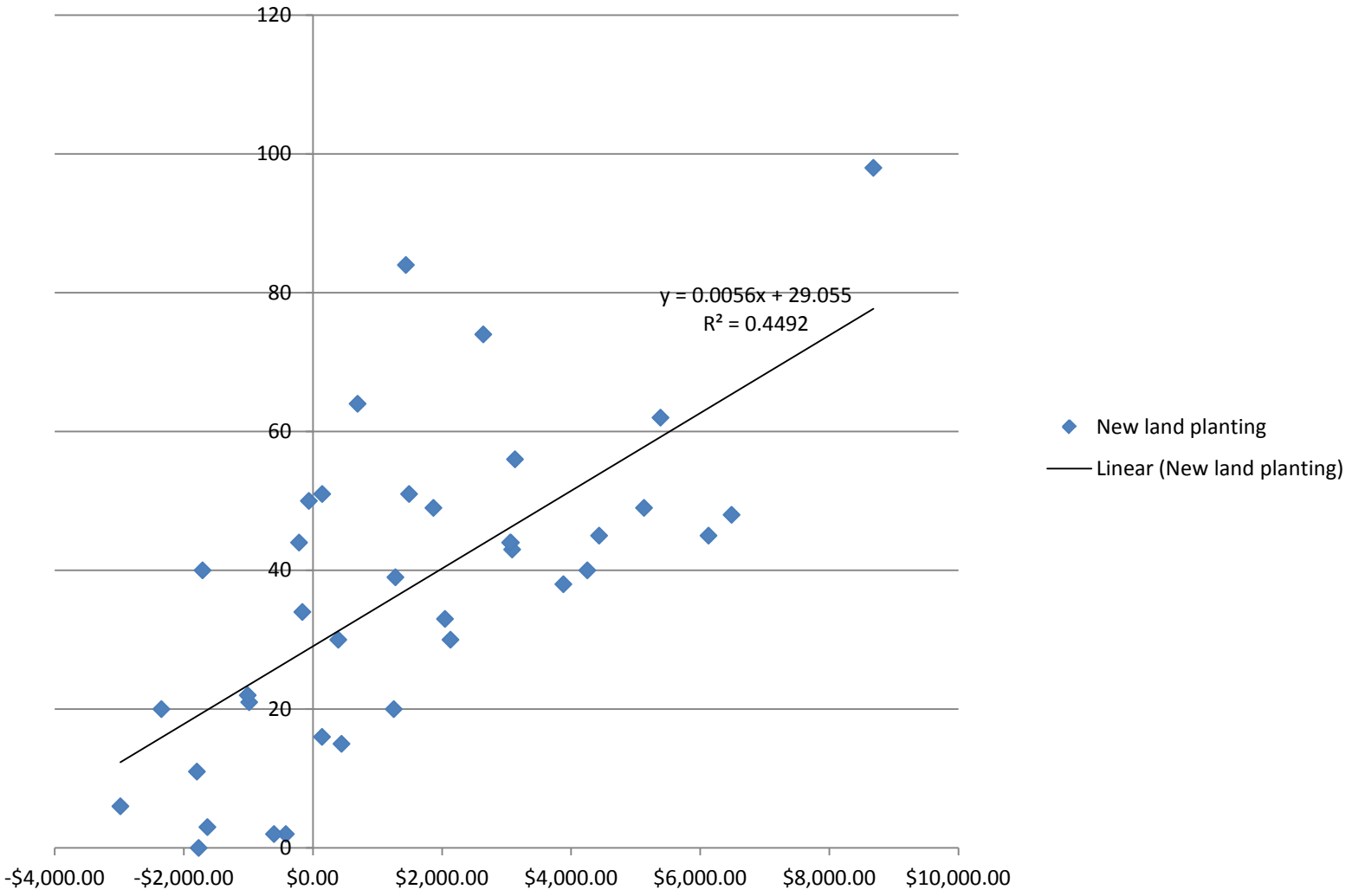
Forestry new land planting



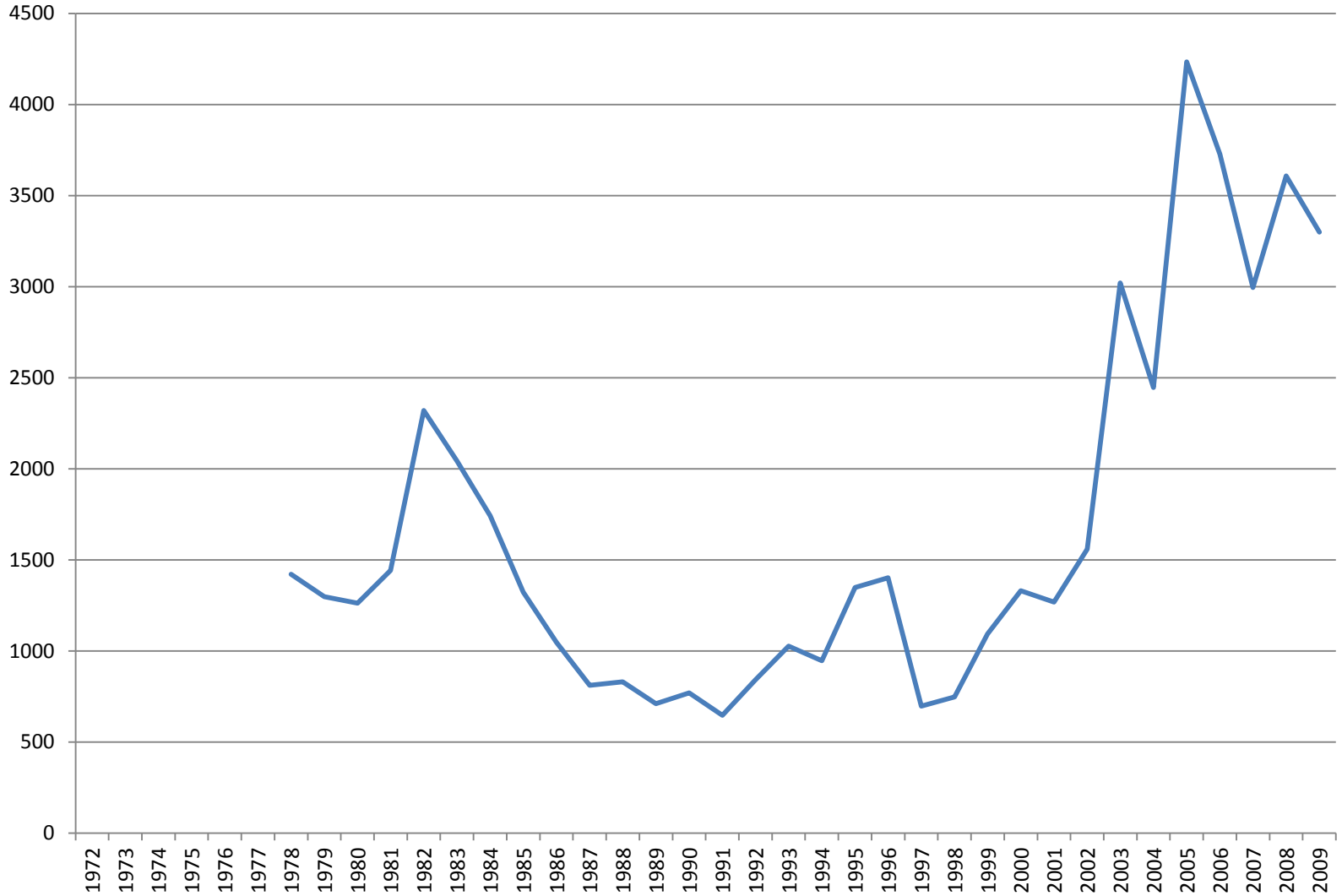
Relationship between new land planting and forestry IRR



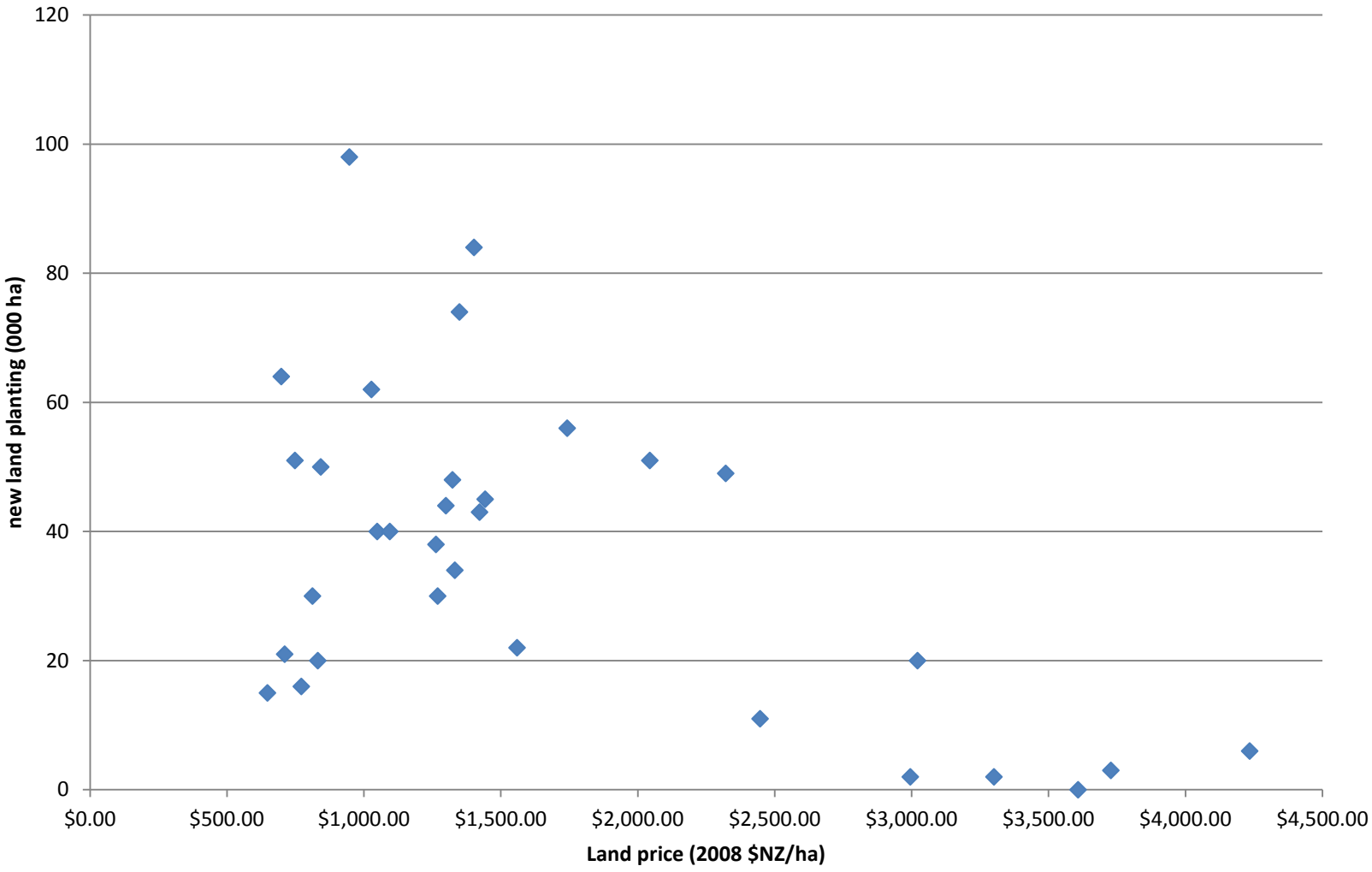
Relationship between new land planting and LEV ($/ha)



Real price of hill country land



Relationship between new land planting and land price



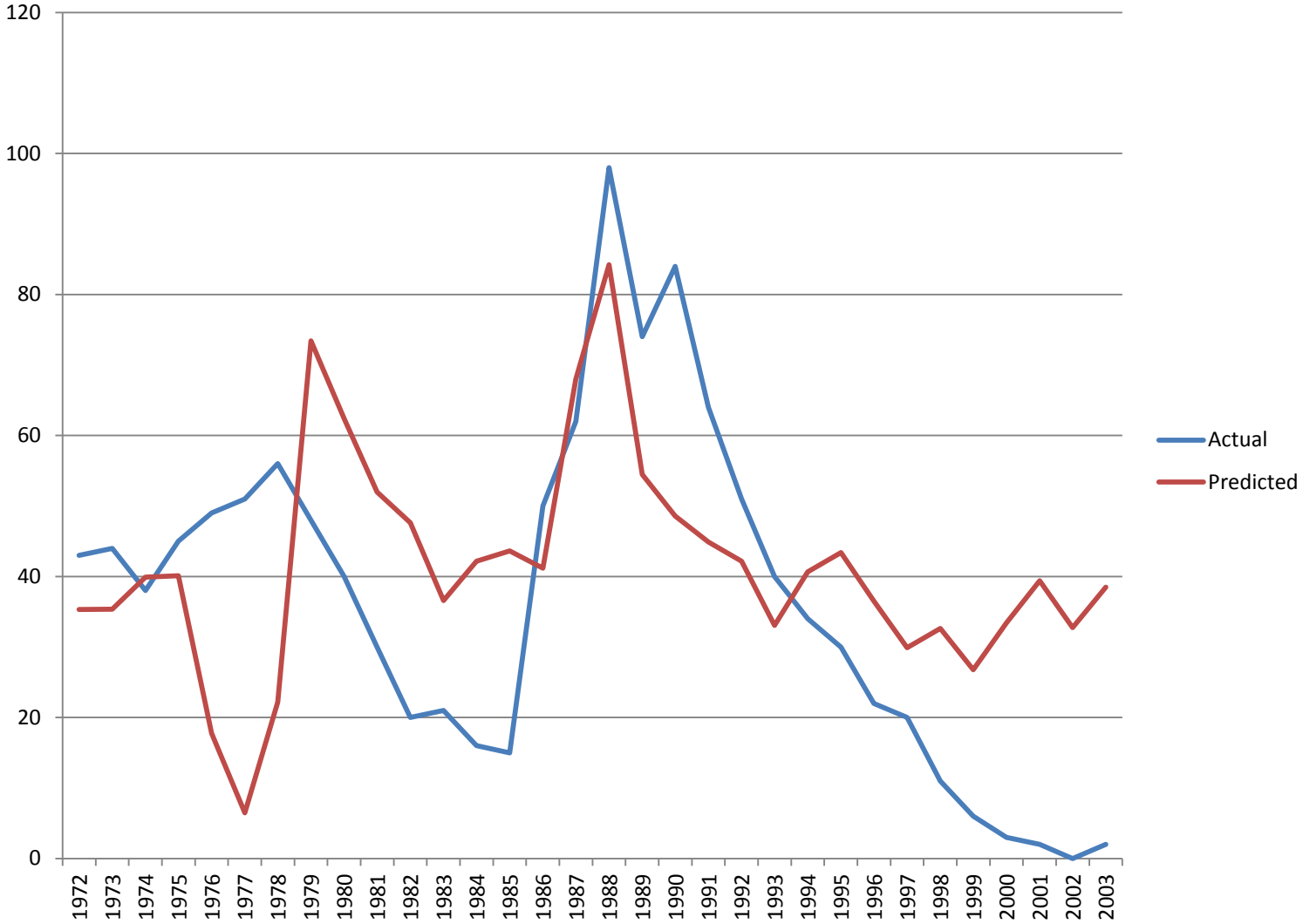
Predicting new land planting

New planting = 41.48 + 0.004923 * LEV – 0.00694 * land price + 0.00163 * subsidies

(5.521) (3.466) (-1.96) (0.306)

R-squared (adj) = 0.4967
Data from 1978 to 2009

Model performance is not particularly good



Other considerations

- In practice, decisions on land use change may be made at the sub property level or the property level
- An investor may buy a farm property and convert it to forestry
- Or an existing land owner may convert parts of the property that are unproductive, or eroding under the existing land use

Next steps

- How would you design and implement an annual monitoring report for forestry
- Methodological issues as above
- Land values for forestry land
- Improve the model of land use change towards forestry